the clarity of Mendel's exposition and to a later age it is difficult to see how his discoveries should not have been recognized till 1900—sixteen years after his death at the age of sixty-two.

The second chapter by Bishop Van Lierde assesses Mendel's character and religious life. The Bishop stresses that the whole record of Mendel's career in the Church contradicts the view that he became a priest through the pressure of external circumstances and without inner conviction.

The third chapter is an assessment of Mendel's scientific interests by the single survivor, Tschermak, of the three biologists who rediscovered Mendel's laws in 1900. It is interesting to read that Mendel was interested in meteorology as well as biology and made observations on sunspots.

The fourth chapter by Sino-Yosito describes the development of genetics in Japan. The importance of the rediscovery of Mendel's laws was appreciated early in Japan and so, starting level with Western Europe and America, Japan now leads the field in some branches of genetics; for example, the genetics of the silkworm and the rice plant.

The second part of the book includes a variety of articles on current research in human genetics; some are review-articles and some are original communications. The quality of these papers is somewhat uneven, but presumably the aim of the editor was to emphasize the vitality of human genetics by drawing on authors from many different countries. The two most noteworthy articles are perhaps those by Dr. A. S. Wiener and I. B. Wexler summarizing their work on the rhesus blood types, and by E. Hanhart summarizing his work on genetically determined diseases in Switzerland.

Translations of the summaries of each paper are given in Italian, German, French and English; it is regrettable that in such a splendid production the English summaries are poorly phrased and sometimes inaccurate.

C. O. C.

WORLD RESOURCES

Brown, Harrison; Bonner, James; and Weir, John. *The Next Hundred Years.* London, 1957. Weidenfeld & Nicholson. Pp. xiii + 208. Price 18s.

DEPRESSINGLY OPTIMISTIC though this book is—for its authors concede that the world could contrive to support a population of 7,000 million, perhaps more—it makes the reader fight every inch of the way to such a hopeful conclusion. No easy assurances, no sedative assumptions are permitted to disguise the magnitude of the task that the world will thus be undertaking. Despite every allowance for the technological advances of our own decade and its successors, the margin of safety, we are told, may be agonisingly narrow. But, say Dr. Brown and his collaborators, the job can be done.

They do not say it *will* be done. All through the book they scrupulously avoid confident prophecy, seeing themselves as consultants rather than soothsayers. They proceed from footholds of fact to handholds of opinion, and for these opinions no infallibility is ever claimed. The three authors named on the title-page are professors (of geochemistry, biology and psychology, respectively) at the California Institute of Technology, and consequently have too much experience of this kind of inquiry not to realize that false horoscopes are more easily cast in the swiftly-changing twentieth century than ever before.

Nevertheless, Professors Brown, Bonner and Weir accept as a public duty the risks inherent in their survey of the hundred years that will last until A.D. 2058. Foresight of this kind is often called alarmist or extravagant, and is all too easy to criticize unless events corroborate it in every detail; but if nobody is willing to interpret the auspices, mankind's progress will be like driving in darkness without headlights. Even if this book turns out to be wrong in many respects — and nothing yet suggests a high probability of error— it will still valuably indicate the look-outs that must be posted during the voyage on which mankind is already set.

The purpose of the authors, as Sir Solly Zuckerman concisely states in his Foreword, is "to consider the possibility that resources, including supplies of energy, can be developed sufficiently fast over the next hundred years in order to cater for the mounting needs of a vastly swollen world population". By "mounting needs" we must understand not only more births, but more birthrights, since the standard of living in all countries must continue to rise if world discontent and upheaval is to be forestalled.

Constant improvement in living standards demands, of course, an ever-growing output of raw materials, without which even food supplies cannot nowadays be sufficiently maintained. On page 33 the authors give us some idea of the difficulties of providing for the rest of the globe on an American scale of subsistence: it would require 18 billion tons of iron, 300 million tons of copper and of lead, over 200 million tons of zinc, about 30 million tons of tin, etc.—well over 100 times the present world annual rate of production. Similar arithmetic applies to other metals, non-metals, fuels and commodities.

But the present population of the Earth is only a fraction of what it might be. How many times, in fact, is it likely to multiply itself before A.D. 2058.? In Chapter VII we are told that Ceylonese are increasing by 2·8 per cent. per annum, Mexicans by 2·9 per cent. and Formosans by 3·5 per cent.—a rate which in 450 years would leave only one square foot of land for each person on the globe. Luckily, not all nations are so expansive. On average, the book favours an estimate of 7,000 million by A.D. 2050 but admits that 12,000 million would be quite possible. In our view, it is even probable, especially if an elixir of longevity is discovered by 1980 or 1990.

Dr. Brown and his collaborators then proceed to enquire whether these 7,000 million people can be fed (for if they cannot, the supplementary problems of their existence are harshly simplified). The answer is Yes, but only at the cost of enormous efforts in land improvement, reclamation, equipment, plant breeding, soil conditioning and so forth, plus a much greater extension of irrigation than all the rivers of the world can ever supply. In other words, evaporated sea-water, at the price of $100–200 per acre-foot, must be made available by the lakeful.

This is the fulcrum on which the whole lever of material uplift will pivot or snap. That the Nuclear Age can produce the energy for processing sea-water by the hundred million gallons is not in doubt; what, however, may be questioned is whether the gigantic storage, pipe-lining and pumping for irrigating whole sub-continents can be engineered, even if it can be powered. A smallish river like the Thames carries much more water (and by gravity too) than the bulkiest pipeline; and the clouds are still our most capacious reservoirs.

Nor are the experts yet agreed that unlimited cheap energy, such as these schemes will require, is within our grasp. If it is not to be achieved, Dr. Brown and his associates admit that Malthus will be grimly vindicated. They therefore devote several chapters to a programme that might vulgarly be called "brain-power for horse-power". Briefly, they say that the production of technicians all over the world must be at least quadrupled, and with all speed. They suggest how it might be quadrupled in the U.S.A., and then rather vaguely imply that the rest of the globe can do the same. But can it? The immense resources that support American higher education do not exist elsewhere.

It must not be concluded that the heavily populated world which the authors say can be made viable would be also the world of their choice. They warn us that it will be busy, complex and precarious. (Another chapter might well have been written on the dangers of epidemics in such teeming communities.) They recommend widespread birth control to slow down the demographic helter-skelter which is running such a perilous race with technology. But one cannot help feeling it will be better for the world if neither horse gallops for ever.

The book is written—and produced—with admirable clarity, reinforced by its twenty-six diagrams. The notes and bibliography repay careful exploration, and Sir Solly Zuckerman contributes a Postscript of special interest to the English reader.

R. A. P.

NATURAL SELECTION

Spuhler, J. N. (Editor). *Natural Selection in Man.* Detroit, 1958. Wayne State University Press. Pp. vi + 72. Price $3·50.

THIS BOOK consists of four papers given at a conference held at Ann Arbor on April 12, 1957. Dr. J. F. Crow gives a mathematical account of some possibilities of measuring selection intensities in man. He proposes an index of total selection, which is the ratio of the variance in number of progeny per parent to the square of the mean number of progeny. Parents and offspring must be counted at the same age, for